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ABSTRACT

This booklet presents an overview of Mission 21, a project that promotes technological literacy in the elementary school classroom. Funded since 1985, Mission 21 has enabled graduate research associates and Virginia teachers to write and field test a technology education program for children in grades 1 through 6. Over 30 elementary teachers in 11 school systems have participated in field testing materials that integrate technology concepts into their present curriculum. Guide activities emphasize creativity using a problem-solving approach to learning. Activities for each grade level are as follows: (1) grades 1 and 2--transportation, explore, design, and space; (2) grades 3 and 4--machines, discovery, community, and connections; and (3) grades 5 and 6--communication, space colonization, invention, and energy/matter. Problem-solving models for grades 3-4 and 5-6 are included. The use of design briefs by students to examine a situation and act upon the problem is explained. Folios to document progress in the problem-solving process are described. Folios can be formatted in journal, chronology, or display formats. A list of regional program officers is included in the document. (NLA)

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An Overview of

MISSION 21

*A Program Designed to Assist Teachers in Integrating
Technology into their Present Curriculum
Through a Problem-Solving Approach*

Grades 1 through 6



Written by:

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Revised, February 1990

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Technology Education
Program Area

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Introduction

This booklet presents a brief overview of Mission 21, a Virginia Polytechnic Institute and State University project funded by the National Aeronautics and Space Administration (NASA) to promote technological literacy in the elementary school classroom. Funded since 1985, Mission 21 has enabled graduate research associates to work with elementary school teachers in the Commonwealth of Virginia to write and field test an innovative technology education program for children in grades 1-6. Over thirty elementary classroom teachers in eleven school systems throughout Virginia have participated in field testing Mission 21 materials.

The Mission 21 resource guide provides direction to elementary school teachers. Teachers use this information to facilitate the integration of technology concepts into their present curriculum. Exciting activities throughout the guide emphasize creativity for all children using a problem-solving approach to learning.

For clarification purposes, the following definitions are provided.

Technology	The study of the application of knowledge, creativity, and other resources to solve practical problems and thereby extend human potential.
Technology Education	The <i>school subject, program, or discipline</i> that focuses on the study of the application of knowledge, creativity, and other resources to solve practical problems and thereby extend human potential.
Technological Literacy	"The competency to locate, sort, analyze and synthesize information that relates to achieving practical purposes through efficient action." <i>Loepp, F. (1986). Technological literacy: An educational challenge. Technology Education Symposium VIII Proceedings. Blacksburg: Virginia Polytechnic Institute & State University, p. 37.</i>
A Technologically Literate Person Understands...	- o The historical role of technology in human development - o The relationship between technological decisions and human values - o The benefits and risks of choosing technologies - o The changes occurring in current technology - o Technology assessment as a method of influencing the choice of future technologies. <i>National Science Board Commission on Precollege Education in Math, Science and Technology. (1983). Educating americans for the 21st century. A report to the american people and the national school board. Washington, DC: Author, p. 74.</i>

MISSION 21

Project Personnel

NASA - Washington, D.C. Headquarters

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Pamela M. Bacon, Program Manager, Educational Affairs Division
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George Wills, Graphic Artist

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Joyce Baker
Carver Elementary School
Newport News, Grade 4
1989-90

Jenny Basham
Cave Spring Elementary School
Roanoke, Grade 5
1988

Marilyn Bondurant
Hillsville Elementary School
Hillsville, Grade 4
1988-89

Lisa Bosley
Dranesville Elementary School
Herndon, Grade 6
1988-89

Mary Ann Bowen
Willard Model School
Norfolk, Grade 5
1985-88

Marian Childress
Clearview Elementary School
Herndon, Grade 5
1988-89

**Field Test Site Teachers
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Linda Corp
Dranesville Elementary School
Herndon, Grade 3
1988-90

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1988-89

Elizabeth Dunlap (Calio)
Willard Model School
Norfolk, Grade 5
1987-88
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Pembroke, Grade 6
1988-90

Patsy Farmer
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1988-89

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Herndon, Grade 3
1988-89

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1988-89

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Pembroke, Grade 4
1988-90

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Clearview Elementary School
Herndon, Grade 5
1988-89

J. Cecil Holt
Dozier Middle School
Newport News, Grade 6
1987-89

Catherine Hurst
Clearbrook Elementary School
Roanoke, Grade 6
1988-89

Nanette Kane
Clearview Elementary School
Herndon, Grade 4
1988-89

Susan Karn
Clearview Elementary School
Herndon, Grade 4
1988-90

Jesslyn Lumb
Clearview Elementary School
Herndon, Grade 5
1988-89

Bobbi Martin
Hillsville Elementary School
Hillsville, Grade 4
1989-90

Tracy Matheson
Dranesville Elementary School
Herndon, Grade 4
1988-90

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Dranesville Elementary School
Herndon, Grade 3
1988-90

Patricia McGinly
Dranesville Elementary School
Herndon, Grade 4
1988-90

**Field Test Site Teachers
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Willard Model School
Norfolk, Grade 5
1988-89

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Dranesville Elementary School
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1989-90

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Roanoke, Grade 6
1988
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Vinton, Grade 6
1988-89

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Norfolk, Grade 3 Consultant
1988-90

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Dranesville Elementary School
Herndon, Grade 3
1989-90

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Herndon, Grade 4
1988-90

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Willard Model School
Norfolk, Grade 4
1988-90

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Herndon, Grade 4
1989-90

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Hiddenwood Elementary School
Newport News, Grade 5
1985-89

Mission 21: A Rationale

People depend on technological developments to simplify their lives and contribute to solving problems. Technology makes it possible to transport people and products around the world and instantly communicate across international borders and into space. It enables products to be made that make jobs less tedious and leisure time more enjoyable. It also provides an abundant energy supply for a mobile, productive, safe, and comfortable society.

But, technology can also create problems. Technological wizardry raises concerns in areas like biotechnology and nuclear energy. Because technology enhances human capabilities to create, produce, reproduce, and destroy, some people sense that technology is in control. Increased comprehension of technology can dispel this feeling.

Unless people fully understand the technological world in which they live, they cannot effectively fulfill their roles as citizens, workers, and consumers. The human-made environment is made possible through technological innovation and human ingenuity. But, do people recognize the limits of natural resources upon which technology is dependent? Are they cognizant of new innovations that may alter lifestyles? Do people appreciate the strides made in technology that have improved the American standard of living and opened a new frontier in space?

Through technology education in the elementary school, children can become aware of their technological world and explore the assets and liabilities of this prevalent force in society. Teaching strategies and learning activities that promote an understanding of technology and the analysis of technological issues and trends can prepare children to deal with the problems and solutions of the 21st century.

NASA Promotes Technological Literacy

The National Aeronautics & Space Administration (NASA) recognizes the need to take an aggressive role in the promotion of technological literacy in America's schools. Through Operation Liftoff, NASA made a commitment to becoming more involved in the development and dissemination of educational materials that focus on the elementary school community. This initiative was designed to stimulate students' interest in the study of technology, mathematics, and science in an effort to ensure their active participation in an increasingly technological society.

As part of this effort, NASA awarded a training grant to the Technology Education Program Area of the College of Education at Virginia Polytechnic Institute and State University (Virginia Tech) in June, 1985. The grant enabled Virginia Tech to hire graduate students as research associates. These individuals developed the rationale and structure of an innovative program to promote technological literacy in the elementary school through a problem-solving approach. The program, titled Mission 21, signifies the focus of the program towards preparing citizens, workers, and consumers for the 21st century.

In cooperation with elementary school teachers throughout Virginia, technology education resource materials and activity ideas have been developed. Teachers field tested the fifth and sixth grade materials from 1986-89 and the third and fourth grade materials from 1988-90. Field testing of the first and second grade materials will begin in 1990.

Mission 21: A Resource for Teachers

The Mission 21 resource guides help elementary school teachers implement technology education concepts into their existing curriculum through a variety of activities emphasizing creativity and problem-solving. The teacher resource guides:

- Establish a feasible framework in which to implement the study of technology into the elementary school curriculum.
- Provide teachers with unique learning activity ideas that can serve as a springboard to new classroom projects, explorations, and experiences.
- Emphasize the importance of creativity and problem-solving as factors to improving student comprehension and analysis of technological problems and solutions.
- Provide teachers with basic information for planning and teaching about technology through problem-solving themes.
- Encourage teachers to use available resources to enhance the curriculum and promote technological literacy.

- Facilitate the process of integrating technology education into the elementary school through a flexible program designed to enhance the existing curriculum and broaden the students' understanding of the technological world.

Each resource guide contains four problem-solving themes with sample problem-solving activities. To aid in implementation, teacher hints, resource listings for printed and audio-visual materials, and teaching aids (sample handouts, overhead transparency masters, etc.) are also included in the guide.

The program is designed to be flexible and does not require "special" equipment or materials. All activities can be completed within a typical elementary school classroom using inexpensive or available materials.

The problem-solving themes were chosen to easily fit into the present elementary school curriculum. Teachers are encouraged to find ways to use these materials as a part of existing subjects in the elementary program. See Table 1 for a listing of the problem-solving themes for each grade level.

Table 1. Problem-Solving Themes

<u>Grades 1-2</u>	<u>Grades 3-4</u>	<u>Grades 5-6</u>
Transportation	Machines	Communication
Explore	Discovery	Space Colonization
Design	Community	Invention
Space	Connections	Energy and Matter

The program is designed to encourage problem-solving and creative thinking. Although any problem-solving model can be employed, the Mission 21 program includes a unique model for each level. Two problem-solving models are presented on the following page (Figures 1 and 2). The problem-solving model for grades 1-2 is still in the developmental stage.

Figure 1. Problem-Solving Model for Grades 3-4

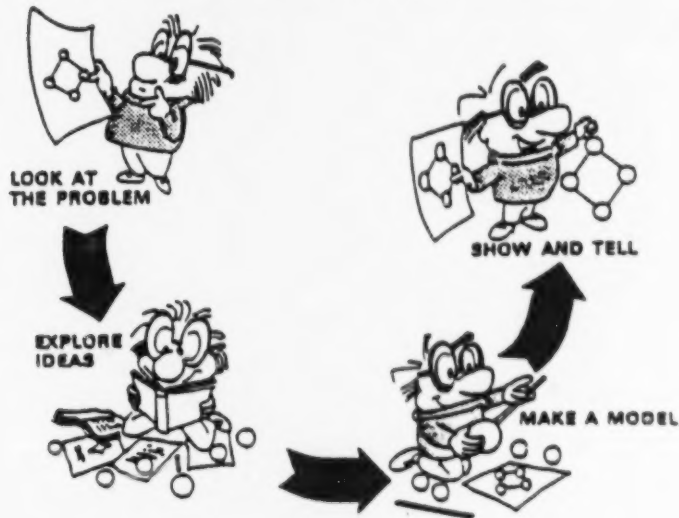
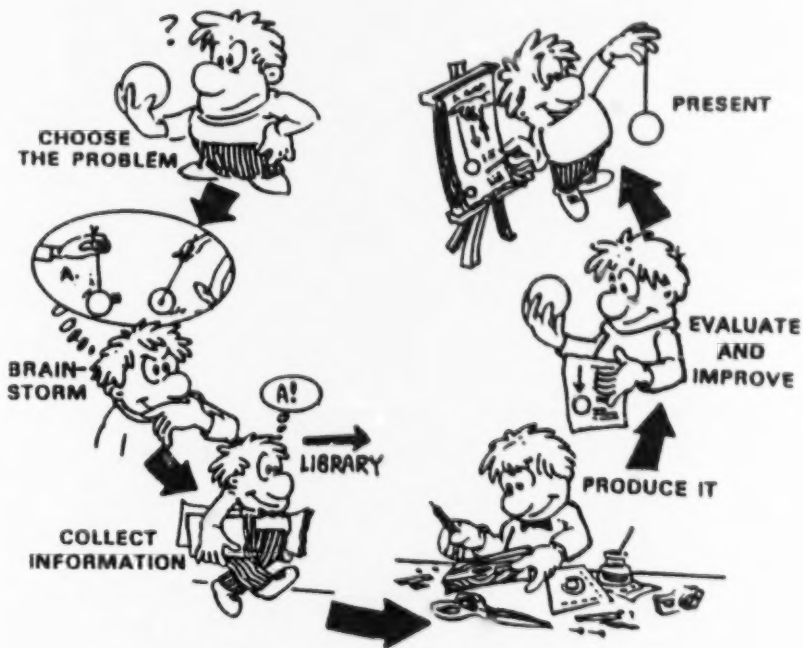


Figure 2. Problem-Solving Model for Grades 5-6



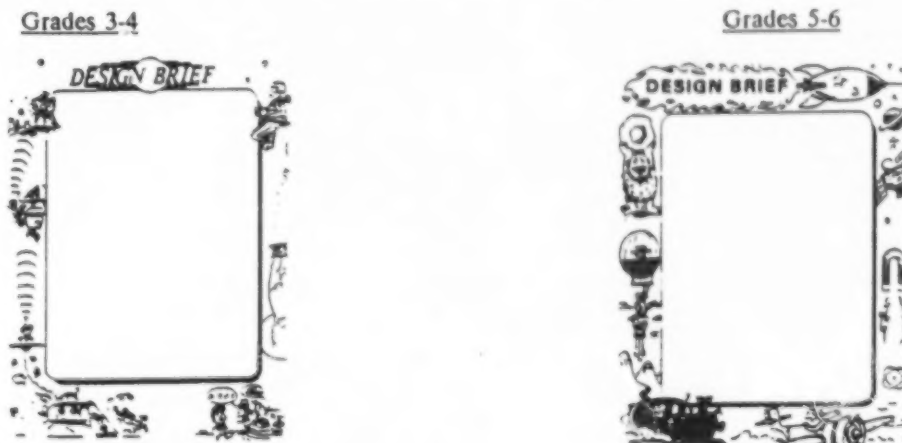
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Design Briefs: Problem-Solving Activities in Mission 21

Design brief is the term given to the formal description of activities in Mission 21 that require the student to examine a given situation and act upon the problem. A design brief describes a situation, which is usually hypothetical, and requests a solution to a given problem. The purpose of the design brief is to encourage the student to think creatively while using the problem-solving process to explore alternative solutions and make decisions regarding an optimum solution to the problem.

In Mission 21, all design briefs are clearly identified by one of the illustrations shown in Figure 3 below. A form for grade levels 1-2 is still in the developmental stages. Teachers can copy the design brief for use in the classroom and use it exactly as it is written. However, they are encouraged to change it to suit their writing style and teaching approach using a blank form provided in each guide.

Figure 3. Mission 21 Design Briefs



Documenting Students' Progress in Mission 21

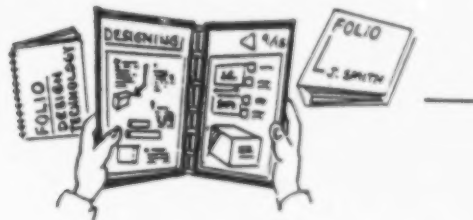
In an effort to document students' progress and application of the problem-solving process, Mission 21 teachers are encouraged to require students to use folios. The folio encourages students to record information and document their research and problem-solving strategy. The purposes of a folio are to:

- Show a lineage of the students' progress from the beginning of the problem to the final solution OR the beginning of the program to the end of the program.
- Document the students' effort and thought processes which will help the teacher and parents understand what the students have learned and how well the students comprehend the concepts.
- Record students' ideas which can assist them in planning better solutions, recalling information and specifications, and developing the optimum solution to the problem.

For example, the sketches below (Figure 4) illustrate several folio designs. Though they vary greatly in complexity and format, folios serve one primary function -- to record students' progress through words and pictures. Teachers are encouraged to provide students with a variety of materials to assist them in preparing folios.

Figure 4. Sample Folio Formats

The Journal or Log



The Chronology



The Display



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Mission 21: Interdisciplinary Technology Education

The importance of technological studies in the elementary school cannot be overemphasized. Technology affects all aspects of human lives and will continue to be a dominant force in the future. It is imperative that efforts be made to include technological studies throughout children's educational experiences.

Through Mission 21, technology education in the elementary school is not only possible, but it can be successful. Mission 21 enhances the elementary school curriculum through flexible problem-solving activities that easily integrate with science, social studies, math, language arts, health & physical education, and art. Mission 21 is truly an interdisciplinary approach to technology education. Furthermore, Mission 21 motivates students to solve problems, think creatively, and make decisions about technology and the future.

For More Information About Mission 21

Mission 21 is progressing through its developmental stages. Some materials are scheduled for publishing and release by Fall 1990. In the meantime, all developmental work for Mission 21 is taking place at Virginia Polytechnic Institute and State University. To add your name to a mailing list to receive notification of product availability or to ask questions about Mission 21, write or call:

----- * -----

*Mission 21 Research Associates
Virginia Polytechnic Institute & State University
Technology Education Program Area
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The National Aeronautics and Space Administration sponsors a number of programs for teachers and students. Furthermore, NASA centers contain a wealth of information and free materials for classroom use. For more information about other NASA programs and materials, contact the NASA center that serves your state or territory. See Table 2 on the following page.

Table 2. NASA Center Education Programs Officers

IF YOU LIVE IN...		CONTACT:
Alaska California Idaho Nevada Utah Wyoming	Arizona Hawaii Montana Oregon Washington	Mr. Garth A. Hull Chief, Educational Programs Branch Public Affairs Office Mail Stop DXI 204.7 NASA Ames Research Center Moffet Field, CA 94035 Phone: (415) 694-5543
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